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Do Advanced Degrees Matter? A Multiphase Mixed-Methods Study to Examine Teachers' Obtainment of Advanced Degrees and the Impact on Student and School Growth

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Abstract

Teacher quality has been found to offset the adverse effect of racial and socioeconomic differences in academic achievement; and teacher quality is often thought to be the product of a quality education. However, existing literature has produced mixed results regarding the relationship between student achievement and teachers' possession of advanced degrees (ADs). Despite these mixed results, ADs are often the most efficient (if not the only) way for teachers to earn certification and salary upgrades. A longitudinal, multiphase mixed-methods explanatory study aimed to bridge shortcomings of existing research on the effects of teachers obtaining ADs. Associations between teacher credentials and middle grades students' academic growth were examined by differentiating teachers' degree level (bachelor's, master's, specialist's) and field (content-related, non-content-related). Teachers and school leaders were also interviewed in order to broaden our understandings of the impact ADs make in areas besides student achievement. Findings suggest that inconsistency in associations between teacher ADs and student achievement may be attributable to variation in a number of individual, programmatic, and institutional factors.

Keywords

Teacher Degree, Advanced Degree, Student Academic Growth, Multiphase Explanatory Mixed Method

Introduction

There is a rich legacy of research examining the relationship between teacher credentials, especially advanced degrees (AD), and student learning outcomes (Hanushek, 1992; Obonyo, Bin, & Maina, 2018). Roughly 56% of U.S. public school teachers hold a master's degree or higher (Institute of Educational Sciences, 2011), and conventional wisdom suggests that those with ADs should possess stronger pedagogical and content knowledge, which should result in higher student achievement. This may explain, in part, why ADs frequently are used as a mechanism for screening employees and as a measure for salary scales (Gordon, Kane, & Staiger, 2006). Yet, despite the large amount of research in this area, the impact of ADs on teacher effectiveness and student achievement remains an open question (Rivkin, Hanushek, & Kain, 2005).

Measuring the direct impact of a teacher's credentials is often difficult due to the multi-faceted nature of teaching and learning (Aaronson, Barrow, & Sander, 2007). Moreover, ADs often are incorporated into larger performance assessments (Kane, Rockoff, & Staiger, 2008; Shuls, & Trivitt, 2012). Still, the literature confirms the importance of having a highly trained, competent teacher in the classroom (Darling-Hammond, Hightower, Husbands, LaFors, & Young, 2002).

The importance of ADs, however, varies based on what and whom one teaches. For instance, the impact of ADs appears to be most significant in high school classrooms. Clotfelter, Ladd, and Vigdor (2007) found that high school teachers who completed a master's degree were more effective at increasing student achievement than those without ADs; yet several meta-analyses showed a negative association between ADs and student achievement in elementary grades, especially in math and reading (Betts, Zau, & Rice, 2003; Dee, 2004; Nye, Konstantopoulos, & Hedges, 2004). Most elementary educators are generalists who teach multiple content areas, and Goldhaber (2015) concluded that possessing a generic advanced degree does little to improve an elementary teacher's ability to increase student achievement.

Alternatively, several studies stress the importance of content-specific ADs, particularly in math and science (Aaronson, Barrow, & Sander, 2007; Harris & Sass, 2007). Goldhaber and Brewer (1996), for instance, tracked 1,800 students from 8th to 11th grade and demonstrated that teachers with content degrees in math and science had a greater impact on student academic performance. A meta-analysis of 21 studies reported similar findings in so far as students in 10th and

12th grade showed higher math achievement scores when their math teacher had a master's degree in mathematics (Wayne &Youngs, 2003).

Research also suggests that African American students' benefit from working with teachers who have earned ADs (Clotfelter, Ladd, & Vigdor, 2007). Ehrenberg and Brewer (1994) reported that African American students showed more gains in achievement when paired with teachers who had ADs. Likewise, Rice (2003), in reviewing several empirical studies to describe characteristics of effective teachers across grade levels and subject areas, found a positive correlation between teachers possessing ADs and academic achievement of African American students, especially in mathematics. This aligns with Dee's (2004) work as well, in which a randomized experiment was conducted to examine a range of variables including the teacher's degree. Dee (2004) found that African American female students who learned from teachers with ADs made significant gains in math achievement.

Achievement gains in high school mathematics and among African American students indicate clear benefit of ADs; yet, there are no consistent patterns indicating a relationship between a teachers' possession of ADs and student achievement overall (Prince, Koppich, Azar, Bhatt, & Witham, 2011; Rivkin, Hanushek, & Kain, 2005). In fact, the majority of studies conclude that degree level is not a strong predictor of teacher effectiveness as measured by student achievement (Aaronson, Barrow, & Sander, 2007; Goldhaber, 2015). However, when it comes to student achievement, "[the] lack of a common definition confounds efforts to determine the effectiveness of education improvement initiatives and thwarts attempts to develop consensus regarding the success of education reforms" (Guskey, 2013, p. 3). As such, a novel approach in evaluating the impact of ADs on teacher effectiveness and student outcomes is necessary in order to identify specific aspects of student learning experiences which reflect the teacher's degree attainment. Determining which areas of teaching and learning are affected most directly by teachers' AD is an important question for degree providers, as well as school and district leaders who, in the absence of definitive evidence linking ADs to student achievement, may cease offering pay increases to teachers who earn ADs. Therefore, more research is needed to explore the relationship between teaching credentials and student achievement.

With this sequential explanatory mixed methods study, we sought to address shortcomings of existing research by investigating the impact teachers with ADs have on student outcomes including student achievement growth. Moreover, based on the literature, we argue it is necessary to differentiate between various levels (i.e., masters vs. specialist vs. doctorate) and disciplines

(content-related vs. non content-related) of ADs. The following research questions guided this study:

1. To what extent do the level and discipline of teachers' degrees influence student achievement?

2. What impact do teachers' obtainment of advanced degrees have on teaching and learning in context and in other areas besides student achievement?

Method

Purpose and Research Design

A longitudinal project was launched to examine the effects of teacher obtainment of ADs on middle grades student achievement in mathematics and reading, and on other potential areas related to teachers' professional growth. We used a multiphase explanatory mixed methods design (Creswell & Plano Clark, 2011), with an initial quantitative study followed by a qualitative study in which we seek to elaborate on and explain the results in more detail. The method is considered *sequential* and *explanatory* because the initial quantitative results are explained further through the qualitative inquiry. Members of the research team selected this particular mixed-methods design since it aligns well with the gaps found in the literature and responds to the aims and goals of the proposed study.

The research design of the study was collaboratively developed using Hopscotch (Jorrín-Abellán, 2016, 2019), a theoretical model and a web-tool that guides researchers in the development of well-informed and methodologically-sound research designs in Social Sciences and Education. Figure 1 represents the key components of the conducted multiphase explanatory mixed methods design. The use of Hopscotch to generate research designs can be seen as an audit trail for the in-depth methodological description of the study, which represents a strategy to ensure the reliability of the quantitative portion of the study, as well as the dependability of the qualitative portion, thereby supporting the overall trustworthiness of the proposed mixed-methods study.

As represented in Figure 1, the study was divided into two phases. Phase 1 involved a quantitative predictive correlational design in which the research team examined historical data on student standardized achievement scores and teacher degree information (provided by the school accountability office) to determine if there is a statistically significant difference in student achievement growth between teachers with ADs and those without. In Phase 2, a qualitative case study

design was employed. The research team conducted a case study including one principal, one department chair, and five teachers (four with ADs and one without it) with the aim of understanding the benefits and limitations of teachers' obtaining ADs.

Phase I: Research Setting and Samples

Setting. Data was obtained from an urban Title I middle school (grades 6-8) in the southeastern region of the United States. The majority of students in this school (68%) are eligible for free or reduced-price lunch. Almost half of the students (47.4%) identify as Black or African American, 27.1% as Latinx or Hispanic, and 14.0% as White. In order to compare student growth data within one academic year, we chose to sample middle grades students as they typically have the same teachers for the entire school year.

Student sample. At the time of the study, students in the sample (N = 1,764) were relatively evenly distributed between 6th (34.8%; n = 613), 7th (31.0%; n = 546), and 8th grade (34.3%; n = 605). The majority of students were African American/Black (46.4%, n = 818) and Latino/Hispanic (34.1%, n = 601). The remaining 19.6% of students (n = 345) were White. See Table 1 for additional information on student demographics and teachers' credentials.

Phase I: Measurement

Student math and reading achievement. The school district had assessed students' math and reading performance using the Measure of Academic Progress (MAP) – a multiple-choice, computer-based assessment administered to students in grades 6–8 in multiple states (The Northwest Evaluation Association, 2013-2015) to assess growth in reading and mathematics over the course of one academic year. Sixth, seventh, and eighth grade MAP mathematics scores from the fall of 2013, winter 2014, and spring 2014 were obtained from the school accountability office.

Teacher degree information. The school accountability office provided teachers' (N = 43) degree information along with their past teaching schedules, which were used to match teachers to the students who had been in their classes. Teacher identifiers were removed and teachers were assigned project IDs which were matched to the scheduling and student achievement data. Teacher degree information included the level of teachers' degrees (i.e., bachelor's, master's, specialist's, and doctoral), as well as the discipline of each degree obtained. See Table 1 for information on the types of teacher degrees in the data set.

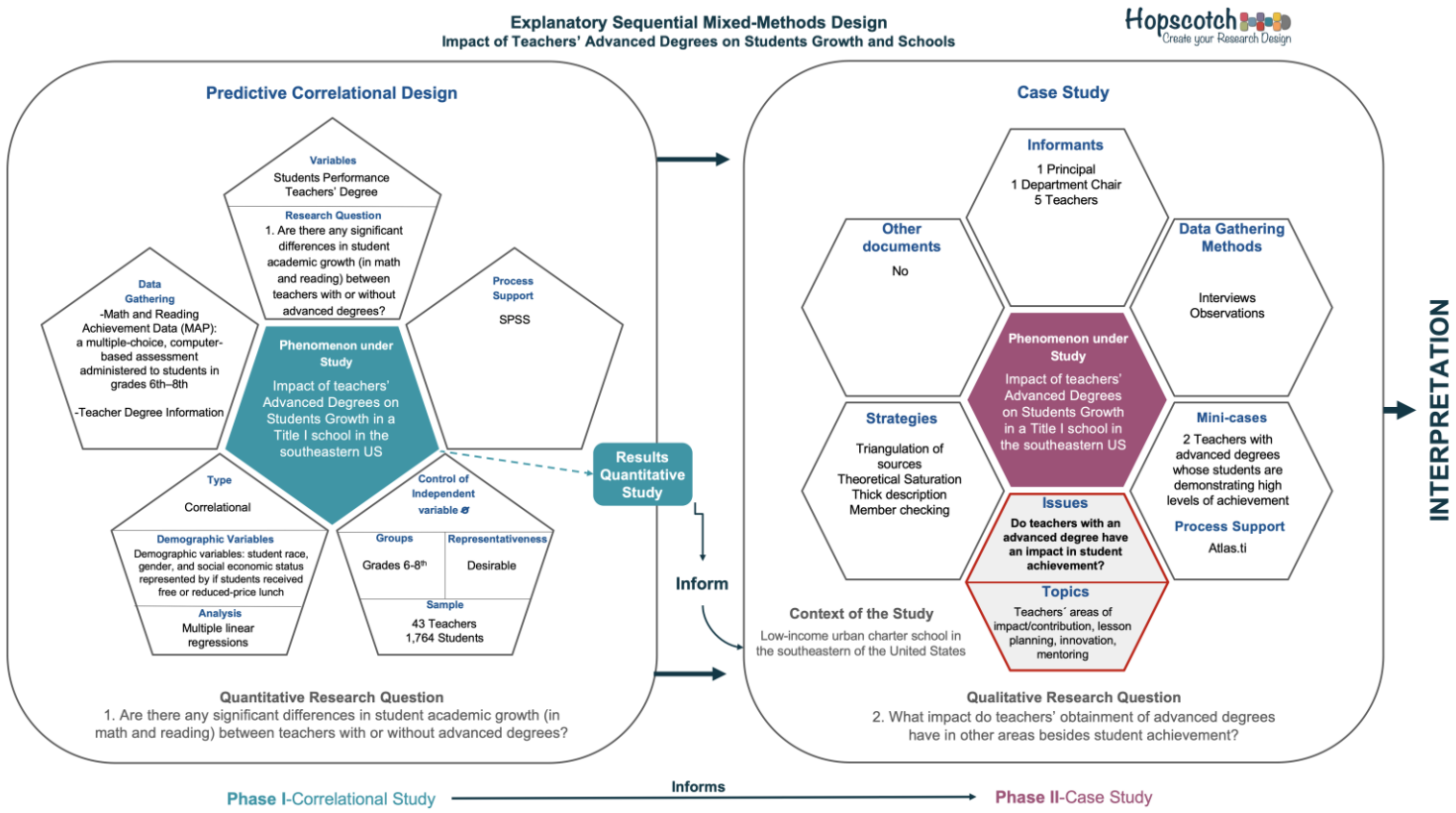

Figure 1. Components of multiphase explanatory mixed methods design generated by Hopscotch (Jorrín Abellán, 2016, 2019).

Table 1

Students' Demographic Information

Demographics		Mathematics (n (%))			Language Arts (n(%))		
		6th (n=613)	7th (n=546)	8th (n=605)	6th (n=672)	7th (n=554)	8th (n=594)
Gender	Female	315 (51.4%)	262 (48.0%)	309 (51.1%)	349 (51.9%)	262 (47.3%)	312 (52.5%)
	Male	297 (48.5%)	284 (52.0%)	296 (48.9%)	323 (48.1%)	292 (52.7%)	282 (47.5%)
Race	White	144 (23.5%)	70 (12.8%)	83 (13.7%)	206 (30.7%)	81 (14.6%)	92 (15.5%)
	Black	266 (43.5%)	235 (45.1%)	317 (52.4%)	250 (37.2%)	264 (47.7%)	319 (53.7%)
	Hispanic	202 (33.0%)	209 (39.5%)	190 (31.8%)	216 (32.1%)	209 (37.7%)	183 (30.8%)
Eligible for free/reduced lunch	Yes	423 (69.1%)	426 (78.0%)	451 (74.5%)	344 (51.2%)	418 (24.5%)	422 (71.0%)
	No	189 (30.8%)	120 (22.0%)	153 (25.3%)	328 (48.8%)	136 (24.5%)	172 (29.0%)
Teacher had an in-field degree	Yes	225 (36.8%)	334 (61.6%)	381 (63.4%)	398 (59.2%)	518 (96.1%)	319 (53.7%)
	No	387 (63.2%)	208 (38.4%)	220 (36.6%)	274 (40.8%)	21 (3.9%)	275 (46.3%)
Teachers by highest degree level	BA/ BS	364 (59.5%)	36 (6.6%)	123 (20.5%)	231 (41.1%)	91 (16.4%)	222 (37.4%)
	MS/ EdS	87 (14.2%)	230 (42.5%)	296 (49.3%)	278 (49.5%)	111 (20.03%)	252 (42.4%)
	EdD/ PhD	161 (26.3%)	161 (29.8%)	182 (30.3%)	53 (9.4%)	337 (60.8%)	120 (20.2%)

In the math department, almost 50% of 6th grade teachers had advanced degrees. Of those who had earned ADs, the majority were master's level, and none were in math or math education. In 7th grade, 40% of the teachers obtained a bachelor's degree related to math or math education, and all but one held an AD at either the master's, specialist and/or doctoral level; however, none of their ADs were in math or math education. In the 8th grade, 85% of teachers had bachelor's degrees in math or math education, and all 8th grade teachers held advanced degrees at either the masters or doctoral level.

In the English department, 43% of 6th grade teachers had ADs (masters and/or specialist), and 43% had at least one degree in English or English education. In 7th grade, 67% of teachers have an AD (masters, specialist, and doctoral), and nearly half had at least one degree in English or English education. In 8th grade, 50% of teachers had an AD (masters and specialist), and 67% had at least one degree in English or English education.

Phase I: Quantitative data analysis

To answer research question 1 (*To what extent do levels or types of teacher's degrees influence student achievement?*) we conducted a series of multiple linear regressions in order to explore the variance of *student achievement* explained by teachers' degree, with ranked-order variable (bachelors, masters, specialist, doctoral degrees) and dummy variables (teachers with an AD in their content-related field). We also included student prior achievement and three student demographic characteristics – race, gender, and a dummy variable representing socioeconomic status (ineligible for free/reduced lunch vs. eligible for free/reduced lunch) as control variables in the regression model. We conducted separate tests for math and reading achievement at each grade level (6th, 7th, and 8th) because each grade had different sets of standardized tests designed for the grade level.

Phase II: Participants and Data Collection

In the second phase of the study, purposeful sampling (Palys, 2008) was used to select the informants. Based on the first phase of study, seven potential participants (i.e., teachers with ADs) whose students demonstrated significant achievement growth were identified . Recruitment letters were sent to potential participants via e-mail. Five teachers (four with ADs and one without) agreed to participate in the study for in-depth data collection (interviews) concerning the impact of ADs on the teachers' ability to increase student achievement. One teacher who had become a department chair at the time of data collection also agreed to particiapte. In addition, we formally requested that the district

leadership team recommend a principal to be interviewed based on the principal's knowledge of the topic at hand. We contact the recommended principal, and he/she agreed to participate in the interview. Separate interview protocols were developed for teachers with ADs, teacher without ADs, and school leaders. Each interview was conducted at the school site and lasted approximately 40. Table 2 describes the background of each informant.

Table 2

Phase II Interview Informants Background

Informants	Experience (Years)	Advanced Degree	Subject or Content Taught
1 Principal	18	M.A.	Science Teacher
1 Department Head	12	Ed.S.	English/LA teacher working towards her Ed.D.
5 Teachers	16.2	1 B.A., 2 M.A., 1 Ed.S., 1 Ed.D.	Teacher 1: English/LA Teacher 2: English/LA Teacher 3: Math Teacher 4: Math Teacher 5: Math

Phase II: Data Analysis

The analysis was based on traditional open, axial, and selective coding strategies (Charmaz, 2006). Interviews with the seven informants were transcribed, and the transcriptions of these interviews served as primary documents in Atlas.ti 7 (2017). One of the researchers initiated an open coding process in order to identify common codes emerging from the transcripts. Ninety-five codes were generated through this process, then reorganized and consolidated (i.e., axial coding) into 40 codes. In a third cycle of the analysis process, a selective coding strategy was used to group the previous 40 codes into 5 core categories. These core categories addressed (a) informants' backgrounds, (b) characteristics of informants' advanced degrees, (c) negative perceptions of ADs, (d) positive impact of teachers with ADs, and (e) tensions or conflict regarding teachers with ADs.

Results

Phase I: Multiple Regression Results

Student math achievement. As shown in Table 3, overall, regression models in all three grade levels were significant (F = 148.64 ~ 290.85, p <.001), and the variables explained 60% to 72% of student achievement ($_{adj}R^2$= .60 ~ .72, p <.001). There was an increase of achievement between two academic terms (b = .69 ~ .82, p < .001) in all grade levels. Neither race nor gender was a significant predictor of student achievement; however, qualifying for free/reduced-price lunch was a significant predictor of student achievement (b = -.05 ~ -.08, p < .05), as expected.

Teachers' advanced degree levels were positive and significant predictors for students' math achievement growth in 6th grade (b =.06, p < .01), but not 7th (b = -.05, p > .05) or 8th grade (b = -.01, p > .05). However, earning at least one degree, regardless of level, in math or math education was a positive and significant predictor for students' math achievement growth in 7th grade (b = .08, p < .05), but not 6th (b = .01, p > .05) or 8th grade (b = -.05, p > .05). Finally, earning an advanced degree in math or math education was a strong and positive predictor of 8th grade students' math achievement growth (b =.12, p <.001). None of the 6th or 7th grade teachers in the sample had ADs in math or math education.

Student reading achievement. As shown in Table 4, overall multiple regression models in all three grade levels were significant (F = 83.01 ~ 152.42, p <.001), and the variables explained 54% to 65% of student achievement ($_{adj}R^2$=.54 ~ .65, p <.001). Neither race nor gender was a significant predictor of student achievement. Students' eligibility for free/reduced-price lunch was a significant, negative predictor of student achievement for 7th (b = -.12, p <.01), but a positive predictor for 8th grade (b = 0.08, p <.01). Prior achievement was a significant and positive predictor for all grade levels (b = .67~.71, p <.001), as expected.

The multiple regression model produced mixed results for teachers' advanced degree level and discipline on student reading achievement growth. Teacher's advanced degree level was not a significant predictor of student reading achievement growth for 6th or 7th grade (b = -.04~.01, p >.05), nor was having an English or English education degree (b = .06, p > .05). However, possession of an *advanced* degree in English or English education was a positive and significant predictor of student reading achievement in 6th grade (b = .24, p <.001) only.

The results for 8th grade were quite different from those referring to 6th and 7th grade. Unlike 6th and 7th grade teachers, 8th grade teachers' degree level was a

positive and significant predictor of student reading achievement (b = 0.33, p <.001), as was possession of at least one degree in English or English education (b = .36, p <.001). However, teachers' possession of an *advanced* degree in English or English education was a significant, *negative* predictor of 8th grade students' reading achievement (b = -.39, p <.001).

Table 3

Multiple Regression Models for 6th, 7th, and 8th Math Achievement

	6th Grade Spring Math (n=564)		7th Grade Spring Math (n=495)		8th Grade Spring Math (n=546)	
	b	t	b	t	b	t
Race	-.03	.35	-.04	-1.3	-.04	-1.76
Gender	.04	1.65	.10	3.48	-.02	-.74
Low SES	-.05	-2.19*	-.08	-2.31*	-.08	-2.18**
Prior Achievement	.82	33.30***	.69	21.46***	.75	26.38***
Degree Levels	.06	2.57**	-.05	-1.45	-.03	-.95
Any In-Field Degree	.01	.29	.08	2.59*	-.05	-1.42
In-Field AD					.12	3.87***
Achievement Mean	226.33		226.72		227.25	
Achievement SD	14.42		13.52		15.783	
F	290.85		148.64		205.15	
df	5		5		6	
p-value	.000		.000		.000	
$_{adj}R^2$	.72		.60		.65	

Note: (1) ***p<.001; **p<.01; *p<.05. The dependent variable for all regressions was the MAP math achievement scores in spring term. (2) Low SES is a dummy variable represented by

student's status of receiving free or reduced-price lunch. Students who are eligible for free or reduced-price lunch was coded as 1. (3) Any degree in-field is a dummy variable represented by if a teacher holds any levels of degrees in math-related field. (4) Advanced degree in math-related field is a dummy variable represented by if a teacher holds an advanced degree in math-related field. (5) For 6th grade, there is no teacher holding any degrees in math-related fields. For 8th grade, there are 3 teachers have advanced degrees in math-related field, so this variable is included only for 8th grade.

Table 4

Multiple Regression Models for 6th, 7th, and 8th Reading Achievement

	6th Grade Spring Reading (n=221)		7th Grade Spring Reading (n=493)		8th Grade Spring Reading (n=495)	
	b	t	b	t	b	t
Race	-.05	-0.96	0.01	0.22	.00	0.01
Gender	-0.01	-0.35	0.03	1.07	0.05	1.48
Low SES	-0.03	-0.59	-0.12	-3.587**	0.08	2.21*
Prior Achievement	0.67	15.15***	0.71	21.236***	0.62	17.23***
Degree Levels	-0.03	-0.65	0.01	.357	0.33	4.05***
Any Degree in Field			0.06	1.852+	0.36	6.17***
AD in Field	0.24	4.83***			-0.39	-4.98***
F	83.01		152.42		98.88	
df	5		5		6	
p-value	.000		.000		.000	
$_{adj}R^2$	.65		.61		.54	

Note: (1) ***p<.001; **p<.01; *p<.05; + p<.10. (2) The dependent variable for 6th grade reading regression was the reading MAP scores in winter term. The dependent variable for 7th and 8th grade regressions was the reading MAP scores in spring term. (3) Low SES is a dummy variable represented by student's status of receiving free or reduced-price lunch. (4) Any degree in-field is a dummy variable represented by if a teacher holds any levels of degrees in English-related field. (5) Advanced degree in English-related field is a dummy variable represented by if a teacher holds an advanced degree in English-related field.

Phase II: Qualitative Findings

In order to build on the quantitative phase of the study and more thoroughly explore how ADs impact teaching and learning in context, we gathered and analyzed interpretive data from seven informants including a principal, a department head, and five teachers. Figure 2 demonstrates the density of the analysis by illustrating the triangulation achieved for each of the five main themes that emerged through analysis. Data pertaining to two of the five themes (i.e., informants' backgrounds, characteristics of informants' ADs) were gathered to determine the perspective from which each informant understood and responded to interview questions. For the sake of brevity and confidentiality, these data are not provided explicitly in the current study; however, these data informed our interpretations and analyses of the participants' responses regarding the remaining three themes: (a) positive impact of ADs, (b) negative perceptions regarding ADs, and (c) tensions and ambivalence involving ADs. In the follow sections, we describe findings with regard to these three themes.

Positive impact of advanced degrees. Participating teachers and school leaders identified 19 benefits of teachers earning ADs. However, only nine of these benefits had strong triangulation. As such, in this section we will address these nine benefits (see Table 5). In addition to the impact teachers with ADs can have on student achievement, the teachers with ADs whom we interviewed believed that earning ADs made them better teachers. As one teacher put it, "The thoughtfulness and the overall dedication that gets you that advanced degree translates into your abilities in front of the classroom." Specifically, teachers recognized the extent to which they applied what they learned in their AD coursework, and the impact these practices had on their students. As one teacher explained, "What I learned in that [AD] program…I put it to use immediately in my classroom. You know, it revolutionized my practice…it has caused me to think differently about why I do what I do." Clearly, these teachers believe that their experiences earning an AD made them better teachers and encouraged them to implement beneficial practices.

Beyond such claims of overall improvement, informants described specific ways in which ADs had shaped their professional practice. For instance, some discussed their increased ability to identify and implement evidence-based practices. Demonstrating their newfound confidence in identifying and utilizing evidence-based practices, one teacher gave the example, "I go to my principal and I say, you know what? [The] research says this is not best practices, or we need this resource because...I can back it up with scholarly research." This is deeply connected as well to informants' reports that ADs bolstered their ability to understand the content and curriculum (e.g., "[The] advanced degree really helps

you understand the content and the curriculum which you're being asked to teach").

Informants also indicated that teachers with ADs were more open to new ideas and innovative instructional strategies. One school leader stated that teachers with ADs showed a "willingness to, I guess, accept change, being able to change; and the advanced degree is a vehicle to hone their skills." Considering the strong connection between open mindedness and collaboration (Mitchell, Parker, and Giles, 2012), it stands to reason that teachers with AD's often ended up mentoring their colleagues. When describing a math teacher with an AD, one school leader explained, "She would try to help other teachers with coming up with innovative ideas for their classroom and different ways of teaching." Through mentoring relationships in which they share what they have learned, teachers with ADs may extend the value of their degrees, support colleagues' professional development, and create an increasingly collaborative and innovative environment.

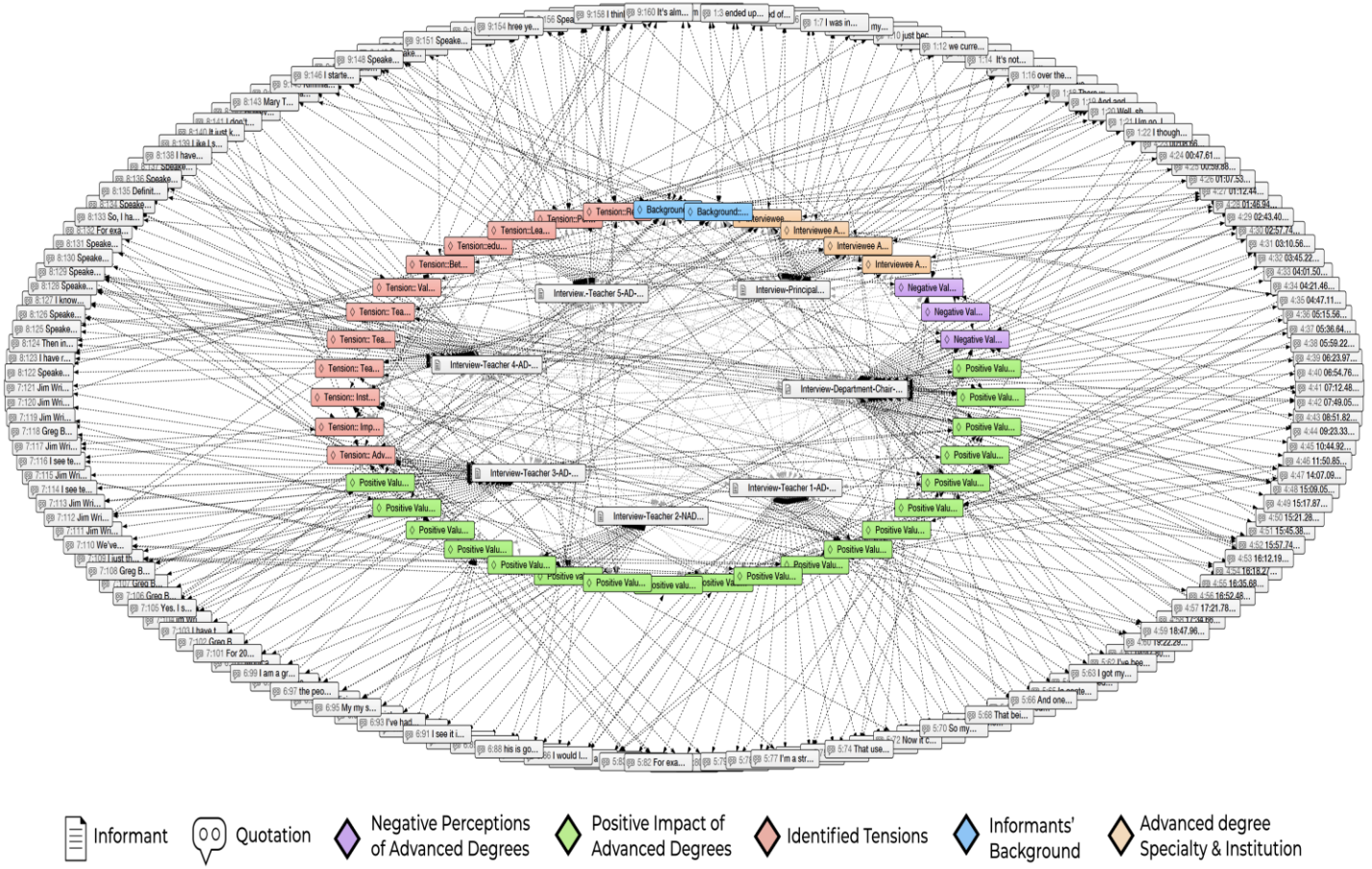

Figure 2. Network view demonstrating the density of analyses conducted and data triangulation.

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Table 5

Codes Regarding Positive Impacts of Advanced Degrees

Code	Example(s) of supporting evidence
AD's make stronger teachers	"Well a lot a lot of times the rigor and the expectation, the thoughtfulness and the overall dedication that gets you that advanced degree translates into your abilities in front of the classroom."
Teachers/leaders with AD are more confident and usually back up their teaching in evidence-based practices	"Knowing the research behind why certain things work and certain things don't work because of my Ed.D, has been valuable, even though it has not changed what I do quite yet. And learning how to search the research that is out there, as department chair, it has given me more of a voice when I go to my principal and I say, you know what...the research says this is not best practices, or we need this resource because...I can back it up with scholarly research"
Teachers with AD's are more open to new ideas and innovative instructional strategies	"Their willingness to, I guess, accept change, being able to change, and the advanced degree is a vehicle to hone their skills."
	"She (math teacher with AD) would try to help other teachers with coming up with innovative ideas for their classroom and different ways of teaching."
Teachers with advanced degrees mentor other teachers	"I see some of them take on greater roles in the school. They become part of the leadership group, taking on a role in mentoring."
Teachers with AD's are more reflective and reflexive professionals	"[One] thing that I've always taken away from it is the importance of reflecting on teaching strategies, and so that's kind of just become an automatic thing always now is looking at my teaching strategies, reflecting on their efficacy, and being able to modify them for the next group, or for the next year, or for another class. That's one effect I can see with that. The other is just kind of the importance that I feel with the data provided. Like, how to use data, and I'm still growing with that, but how to use the data provided on test scores."
Teachers with AD's are involved in activities to	"I see teachers more involved in conferences, you know, presenting to other schools. So, I do see outside the

disseminate their work	classroom a little bit some activities that those teachers tend to take."
Teachers with AD's understand the content and the curriculum better	"[When the Georgia Performance Standards were rolled out] those of us that had advanced degrees, we really kind of helped them with the content and with all of the lesson planning, lesson strategies, the worksheets, everything they needed…So we helped them with all of that in order to help build their content knowledge as well."
AD's help teachers connect with other teachers from other schools and districts	"... one of the main reasons why I decided to…get my advanced degree was because I like interacting with other teachers at other schools and districts. Just the connections that you build, and the sharing of ideas. I had that the initial semesters, and this semester."
AD's have a direct impact in the classroom	"What I learned in that program (MAT)…I put it to use immediately in my classroom. You know, it revolutionized my practice…it has caused me to think differently about why I do what I do."

Finally, informants discussed the impact of ADs on teachers' involvement outside the school itself. As one teacher explained, "One of the main reasons why I decided to get my advanced degree was because I like interacting with other teachers at other schools and districts. Just the connections that you build, and the sharing of ideas..." Teachers with ADs were also believed to be more interested in disseminating their work (e.g., "I see teachers more involved in conferences, you know, presenting to other schools. So, I do see outside the classroom a little bit some activities that those teachers tend to take"), which provided another avenue through which they were able to engage with colleagues from other schools, districts, and beyond.

Negative perceptions regarding advanced degrees. Informants voiced few negative perceptions about ADs, although they mentioned two topics, teacher quality and AD quality, that were perceived negatlively in specific circumstranes (see Table 6). Despite the obvious value teachers and school leaders saw in acquiring an AD, none of the seven participants reported believing that a direct relationship exists between ADs and teacher quality. As one school leader expressed,

> Just because you have a doctorate, you shouldn't be better than anybody else…I always look at observational data as well as achievement data to make decisions on you know, who can contribute what, and the advanced degree pieces have never been really on my radar.

Teachers echoed this sentiment with statements such as "It's certainly possible to have an advanced degree and still not be effective," and "I have seen people with advanced degrees who just don't have the relationship with the students that they need." Regardless of how much ADs affected the participating teachers' practice and understanding of their field, they and the leaders in their school acknowledged that this was not a guaranteed outcome of earning an AD.

Informants also identified potential reasons ADs are not valued equally in every state or district, especially with regard to pay increases. The teachers and school leaders we spoke to described how the quality of ADs differ considerably depending on the institution granting the degree (e.g., "I've seen people get a degree from a place they don't even know where [the university] is"). As one teacher explained, there are AD programs in which "you pay a certain amount of money, you'll have a specialist degree or other advanced degree that comes fairly quick." Informants reported that, due to negative perceptions of degree quality, some districts had stopped offering pay increases to teachers who obtained ADs.

Tensions regarding the impact of advanced degrees. Participating teachers and school leaders identified 12 tensions and conflicting beliefs about the potential influence teachers with ADs could have in their schools. Table 7 summarizes the six tensions in which we observed strong triangulation.

Table 6

Codes Regarding Negative Perceptions of Advanced Degrees

Code	Examples of supporting evidence
No direct/consistent relationship AD's and student achievement.	"…just because you have a doctorate you shouldn't be better than anybody else um… I always look at observational data as well as achievement data to make decisions on you know, who can contribute what, and the advanced degree pieces have never been really on my radar." "I know the best teachers that we have there. I think the best ones have advanced degrees, and the ones that did a great deal of growth have advanced degrees, and if I think through some of the mediocre teachers that may not have that level of growth, most of them do not have … or some of them I should say, do not have advanced degrees. However, it's certainly possible to have an advanced degree and still not be effective."
No direct/consistent relationship between AD's and teaching quality.	"...now it seems that how well a teacher does or performs is established early on almost by fire, and then they become those go-to teachers that year after year their kids overperform…We don't see a shift when they get the degree necessarily. Those teachers become identified and it's very rare [for] their scores to decline, or…they may decline but not in relationship to what other teachers can do." "Definitely those that have the content and have that relationship, their scores are usually higher than those without. But like I said, I have seen it with advanced degrees and not really that relationship piece, that it's not necessarily as high as those that have both."
It has become too easy from teachers to earn AD's from inadequate institutions.	"I think that there is something to be said for traditional institutions and more often the traditional requirements for advanced degrees." "I've seen people get a degree from a place they don't even know where it is.. I just know that online and on weekends you pay a certain amount of money you'll have a specialist degree or other advanced degree that comes fairly quick"

We refer to these as *tensions* due to informants' desire to champion ADs for teachers while also acknowledging concerns, doubts, and ambivalence about individuals and institutions involved with ADs. The most fundamental of these tensions arose when informants acknowledged the presence of teachers with ADs in their school who were not perceived as effective teachers; however, they positioned these cases as exceptions, not the norm. An informant noted, "There are *a couple of teachers* who have [specialist] degrees who are not effective in their classrooms. *I would have never guessed that they had an Ed.S."* (emphasis added). The phrase "a couple of teachers," along with irregularity connoted by stating, "I would have never guessed that they had an Ed.S." evidence that this informant associates ADs with effective teaching. Still, she acknowledges that an AD will not fix an ineffective teacher.

Table 7

Codes Regarding Tensions in Participants' Beliefs about Advanced Degrees

Code	Example(s) of supporting evidence
Skepticism about impact of online ADs and degrees from low-quality institutions	"One of my teachers got his degree online, and not all online programs are bad… however he said it was a joke!"
	"I think it would be difficult to get a degree, a quality degree in mathematics through an online program. Maybe I'm wrong, but I just think that's something that it's beneficial face-to-face, to have a discussion and be able to ask questions, to have someone continually checking in on that."
Teachers with ADs get better student achievement scores because they usually teach advanced courses	[A department chair was asked if he/she sees a relationship between student growth/academic achievement and teachers' education level] "The reason why I'm hesitating is because we have so many different levels and classes we offer that many times those with higher levels of education usually teach more advanced classes, so their students do really well... but those who teach the lower level classes, there students don't perform that well."

	"I'd say it [the main reason teachers get AD's] would be financial, number one, and then an advancement in your career, a promotion."
Beliefs about teachers' motivations for pursuing ADs	"Internal desire to learn more. I wish I saw that more because I feel like we're teachers, we should be passionate about education and learning more but I do think for the most part people just want that instant gratification of something."
Some teachers with ADs are effective instructors; others are not	"There are a couple of teachers who have advanced degrees who are not effective in their classrooms. I would have never guessed that they has an Ed.S...One of them, he got his degree online, and he knows his content well, but he has issues delivering it."
Beliefs about relative value of content/teaching AD's versus leadership AD's	"I'm a huge believer in having a degree in the content area. I just think it opens up a whole other area for people and it's beneficial for the person individually as well as their students that they're teaching. I'm 100% believer in advanced degrees also because I do think it helps build you. We're in the profession of teaching and learning and I think part of that is being a life-long learner and acquiring knowledge."
	"We currently have a significant number of classroom teachers who have doctorates, but [the ADs] are in leadership, and when you talk to [these teachers], regardless of what their philosophical or academic approach is to having that [AD], they intended to get it to become school leaders of some sort or another."

Informants also identified tensions regarding the inconsistent quality or value of ADs. ADs earned online were a common targets of doubt and suspicion. For instance, a school leader reported, "One of my teachers got his degree online [and] he said it was a joke!" Continuing, this school leader insisted, "but not all online degree programs are bad." Similarly, informants noted that the value of ADs (in terms of improving teacher quality and student achievement) varied by discipline. Specifically, ADs in leadership were viewed by some as counterproductive in terms of instructional capacity. A school leader reported, "We have a significant number of classroom teachers who have doctorates, but they are in leadership…[The teachers] intended to get [the AD] to become school leaders of some sort." Had these teachers earned doctorates in their content areas,

this informant may have felt differently about the instructional/institutional value of the degree.

Tension also arose around the idea that teachers with ADs saw higher student achievement scores. When presented with this idea, teachers noted that those with ADs often teach advanced courses as opposed to lower-level classes in which fostering student growth may be more difficult. As one teacher explained, "We have so many different levels…[Those] with higher levels of education usually teach more advanced classes, so their students do really well. [Those] who teach the lower level classes, their students don't perform that well." This implies that teachers with ADs may be viewed as more expert in their content areas, and therefore better equipped to challenge advanced students through more rigorous, in-depth content-area instruction.

Finally, informants questioned teachers' motivations for pursuing ADs. They recognized that many teachers are interested in becoming better educators and have an "internal desire to learn more." However, many believed the main reason teachers pursued ADs "would be financial, number one, and then an advancement in your career, a promotion." Implicit in this attitude is the assumption that those who pursue ADs for the right(ous) reason (i.e., to become a better teacher) are more inclined to benefit from their coursework, whereas teachers who earn an AD for self-serving reasons are no more effective when they complete the degree than when they began it.

Discussion

Results of the quantitative phase of this study mirror the larger body of literature on the relationship between student achievement and teachers' ADs. That is to say that our findings were mixed and lacked an *immediately obvious* pattern in terms of why a given factor (i.e., degree level, discipline) was significantly related to achievement growth in one grade or content-area, yet not in another. Findings such as these are particularly well-suited for sequential explanatory mixed-methods research, as the qualitative inquiry is designed to identify potential explanations for what might otherwise appear inconclusive or inexplicable through quantitative means alone (Creswell & Plano Clark, 2011).

The qualitative data provided additional insight into the specific ways that teachers and school leaders believe ADs make a positive impact in their school, as well as potential negative perceptions of ADs. Perhaps most importantly, the qualitative data revealed tension, skepticism, and uncertainty among teachers and school leaders about (a) particular types of AD programs and institutions, (b) the impact of ADs in disciplines outside one's content area, and (c) associations

between ADs and student outcomes as opposed to teacher outcomes. Within these tensions lie plausible explanations of why and how the impact of ADs may differ so dramatically from one teacher to the next, and may advance existing understandings of why measuring the direct impact of a teacher's credentials remains such a complex and difficult endeavor (Aaronson, Barrow, & Sander, 2007).

Distinctions Between Effective and Ineffective Advanced Degrees

Informants identified qualities of AD programs and institutions which they believed to be instrumental in determining the extent to which students might benefit from their teacher earning an AD. They acknowledged that teachers were happy to earn a salary upgrade along with their AD, but those who earned the degree *solely* to get an upgrade did not become better teachers as a result, nor did their students' outcomes improve. Similarly, informants reported that teachers who pursued ADs in leadership generally were interested in positions outside of the classroom, and therefore did not become better teachers. On the other hand, teachers who were motivated, at least in part, by the desire to better serve their students and earned degrees in content-area teaching were said to alter their practices and find innovative ways to promote learning, understanding, and growth in their students.

Teachers and school leaders were also skeptical of the practical impact of online AD programs, which draw many teachers and working professional due to the inherent flexibility of online coursework (de Ramirez, 2018). Although the instructional quality in online and face-to-face graduate education courses has not been found to differ significantly (Topper, 2007), informants reported that many online programs did not appear to hold teachers accountable for learning the material, and therefore were seen as poor methods for promoting teacher effectiveness and student achievement. At the same time, they acknowledged that effective online AD programs exist, and that teachers could benefit from earning an AD online.

Although these tensions and the attitudes that undergird them are inherently subjective, they reflect a complex constellation of teacher, degree, and institutional factors that may interfere with the possibility of systematically measuring the effect of ADs on student academic outcomes. This very complexity may explain why the majority of the studies attempting to measure the impact of ADs have failed to identify a consistent pattern or relationship between teacher ADs and student achievement (Aos, Miller, & Pennucci, 2007; Clotfelter, Ladd, & Vigdor, 2007; Rivkin, Hanushek, & Kain, 2005). Moreover, it highlights the need for more longitudinal, mixed methods, and embedded research designs in

order to identify the individual, institutional, social, and contextual factors that allow teachers to benefit from earning advanced degrees.

Importance of Discipline in Understanding the Impact of ADs

In both phases of the study, we found evidence to suggest that the discipline in which an AD was earned affected the impact of the AD itself. Specifically, the impact was limited when there was misalignment between the content-area one taught and the field in which one's AD was granted (Goldhaber, 2015).

Qualitative data included reports from informants about key benefits of AD programs that help teachers master content and curricula, make evidence-based instructional decisions, and develop/implement innovative instructional strategies that ultimately could promote student achievement. These benefits require in-depth content-area-specific understanding of instruction and assessment as well as content and curriculum.

The regression models for math achievement also offered support regarding the potential mediating role of degree field in determining the impact of ADs on student achievement growth. Specifically, we found that the relationship between teachers' AD levels and disciplines varied depending on students' grade levels. In fact, a different variable was significantly and positively related to student achievement growth at each grade level: Degree level (regardless of discipline) was associated with 6th grade math achievement, having a math or math-education degree (regardless of level) was associated with 7th grade math achievement, and having an AD in math or math-education was associated with 8th grade math achievement. One possible explanation for this progression involves the development of *pedagogical content knowledge* (PCK) through math-specific AD programs. According to Van Driel and Berry (2012), PCK "goes beyond the acquisition of instructional strategies…to include an understanding of how students develop insights in specific subject matter" (p. 27). For math teachers, PCK is about knowing how to teach mathematical concepts to students in context.

It is noteworthy also that PCK becomes increasingly important as content becomes more complex and abstract. If math teachers do, in fact, increase PCK through AD programs in math/math-education, this may help explain why 8th grade achievement growth was significantly and positively associated with ADs in math/math-education while the association was not significant in lower grades where the content is less complex. Once again, this echoes various studies in which content-specific ADs have been associated with student academic

performance in secondary classrooms (Aaronson, Barrow, & Sander, 2007; Harris & Sass, 2009; Waynes & Young, 2003). Thus, we argue that past failures to find positive effects of ADs (Aaronson, Barrow, & Sander, 2007) might be due to the omission of degree field or discipline as a mediating factor in the relationship between degree level and student achievement.

Additional Outcomes of Teachers' ADs

Findings from the qualitative phase of our study illustrate the profound impact teachers with ADs made in several areas other than student achievement growth. Informants reported that teachers became more reflective and reflexive through advanced studies of pedagogy and content in the process of earning ADs. Teachers also developed new networks which helped them connect with learning communities both within and beyond their school buildings. It was noted also that teachers with ADs, as well as those working toward ADs were likely to become teacher leaders in their schools, which magnified and extended the scope of their impact beyond their own students as they mentored other teachers and sought out new learning communities.

If teachers with ADs do in fact impact their schools and colleagues to the degree described by our informants, it may complicate efforts to measure the association between teacher degree level and student achievement. Our informants suggested that teachers who earn ADs support the professional growth and development of their colleagues, serve as mentors, and incorporate expertise from outside of school, all of which are central to creating positive academic environments (Walter & Briggs, 2012). According to a recent review of research on associations between students' academic outcomes and features of school climate, "The quality of an academic environment as an important predictor of student achievement has been extensively documented in samples of elementary, middle, and high school students," (Wang & Degol, 2016, p. 326). Thus, it is plausible that differences in student achievement growth between teachers with ADs and those without ADs may be smaller than expected due to the ways that teachers with ADs positively impact the academic environment, thereby influencing the academic outcomes of students throughout the building. Although we cannot say with certainty whether teachers with ADs impact schools to this degree, our informants' accounts and the literature on academic environment and school climate suggest that additional research on the topic is warranted.

Conclusion, Implications, and Limitations

The study presented in this article is methodologically innovative, having employed a mixed-methods approach to tackle a topic that has traditionally been

examines through positivistic frameworks using quantitative methods. Our deliberate and rigorous pragmatic mixed-methods approach allowed us to present a holistic perspective not only of the effects that teachers' ADs have on student achievement, but also on the impact teachers with ADs have on the teaching/learning environment in which they reside.

In order to ensure that analyses and interpretations of data were meaningful and unbiased, the researchers collaborated closely with district leaders, school leaders, and teachers. The results offer a realistic view of the benefits and tensions of teachers earning ADs, and should inform the work of district/school leaders and policy makers. Specifically, policy makers should be cautious when revising policy regarding teacher certificate upgrades or compensation policies. These policies dictate the disciplines in which ADs must be earned in order for teachers to receive certificate and salary upgrades. Our study, along with much of the existing literature, suggests that secondary (6-12) students benefit when their teachers have content-area ADs; thus, policy makers should encourage middle grades and high school teachers to pursue ADs in their content areas through these policies.

As with all research, our study was not without limitations. Although positive effects could be identified from the present study, the subject areas that we examined were limited due to constraints on data availability. Only math and reading data were available in the standardized format that allowed for meaningful comparison and interpretations of growth data with multiple time points. Future studies could consider other subjects if the assessments were implemented multiple times and if the metrics allowed for meaningful and accurate interpretations of growth. In addition, this study only examined data from one school district; therefore, future investigations could consider larger-scale studies with more widespread samples across school districts.

In the future, research on the impact of teacher ADs should consider student voices and perspectives with regard to teacher effectiveness. In addition, case studies could be implemented in order to examine further the ways in which ADs promote teacher growth with respect to their instructional practices. Future studies could also examine the quality of programs offering ADs to teachers.

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